Wisconsin
Department of Commerce

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Program Letter
Bureau of Storage Tank Regulation
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Underground Storage Tank Lining

As the Federal EPA December 1998 upgrade deadline approaches many tank owners are addressing corrosion protection to complete the compliance requirements. One alternative to provide corrosion protection on an existing tank is interior lining. Storage tank lining is performed to provide an internal corrosion resistant barrier between the steel tank wall and the product stored or the internal tank environment. The primary culprit of internal corrosion is water which may be the result of condensation or seepage. In the case of a hazardous substance the product stored may have acidic or alkaline properties which cause tank shell corrosion.

Over the past year the Department has received comments and documentation that bring concerns relating to the lining process or the long term integrity of the tank lining. Several of the concerns relate to early failure of linings discovered during the ten year internal inspection. Department staff have viewed photographs of linings hanging from the top of the tank, linings that are cracked or wrinkled, and linings that are chipped, flaked or fragmented. Tank owners and others have related stories about holes being plugged that exceed the allowable dimensions, plugs that were not coated with the lining, and the use of heat lamps to raise the temperature inside the tank. This does not mean that all linings are destined to fail or that all people conducting tank lining are circumventing accepted practices and procedures. The intent of this program letter is to communicate information, create an awareness, and implement greater regulatory oversight of the UST lining process.

Companies providing UST lining have developed several creative concepts in attempting to sell an owner on the merits of interior tank lining, such as:

- The EPA chose tank lining as the No. 1 corrosion protection upgrade option.
- The interior lining provides corrosion and release protection against interior and external corrosion.
- The interior lining increases the structural strength of the tank walls.

This program letter will not address the merits of the statements other than to advise tank owners to ask for supporting documentation and guarantees.

Internal lining does not reduce the corrosion potential of the tank shell exterior. Only if the lining is applied properly will it inhibit corrosion of the internal wall. Corrosion induced UST failure statistics commonly referenced are:

- 10% from internal corrosion
- 19% from internal and external corrosion, and
- 71% from external corrosion.

These statistics imply that even with interior lining, the tank shell is very likely to erode from external corrosion.

Storage tank lining must be conducted in accordance with (ILHR 10.27 (7)) NLPA Standards 631 - Entry, Cleaning, Interior Inspection, Repair and Lining of Underground Storage Tanks or API 1631 – Recommended Practice for Interior Lining of Existing Steel Underground Storage Tanks. Both standards are similar in criteria for determining a tank is suitable for upgrade. NLPA 631 requires that the lining be applied to minimum thickness of 100 mils and a nominal thickness of 125 mils. API 1631 recognizes the manufacturer's specifications. NLPA requires a certification form be provided that tanks meets upgrade requirement, API does not.

The internal area is considered a confined space and hazardous atmosphere. An exception, the hazardous atmosphere condition is not present during the period after the tank is sand blasted, but before the lining process has commenced, and the period after the lining is cured, but before product is introduced into the tank. The two primary risks are exposure to toxic fumes and ignition of flammable vapors from static electricity.

After the tank is rendered product free the final cleaning and surface preparation consists of abrasive cleaning, generally referred to as sand blasting. An 18 grit abrasive is required. The sandblasting procedure and amount of grit material is dependent upon the product stored and conditions in the tank. Twenty-four hundred to fifty-five hundred pounds of grit would be expected to be used for a 10,000 gallon tank. The use of less grit probably means that the blasting job is less than adequate.

A skilled operator can conduct the blasting operation very expeditiously. Grit will be forced through a hose at 90 - 100 psig nozzle pressure, cleaning the tank shell interior to white metal. Low pressure will result in an inadequate cleaning and too high a pressure may result in taking off metal or blasting holes in the shell. Blasting should not be performed if the relative air humidity in the tank is greater than 85% or the internal tank surface temperature is less than 5^{o} F above the dew point.

A brass ballpeen hammer test *may* be used prior to the abrasive blasting to open rust plugs and establish the size and number of perforations. This activity is typically a random (should be methodical) hammering away on the tank. The intent of a ballpeen hammer test at this stage is to determine if the tank meets the basic criteria for lining. It is at this point where decisions are frequently made which do not conform to the code. A tank is not suitable for upgrade if the number or size of perforations do not conform to the parameters of the standard. The code also states that rust plugs or holes in the tank shell shall initiate an assessment.

> **ILHR 10.734 SITE ASSESSMENT**. (1) GENERAL. When a site assessment is required by this chapter, or when directed by the department, owners and operators must measure for the presence of a release where contamination is identified or is most likely to be present at the UST site.
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> (2) EXCEPTIONS. (a) A site assessment shall not be required for tanks that are closed or undergo a change-in-service if one of the external release detection methods allowed in Ss. ILHR 10.61 (5) and (6) is operating in accordance with the requirements of s. ILHR 10.61 at the time of closure and indicates that no release has occurred.
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> *(b) A site assessment shall not be required for tanks which are lined if a visual internal inspection is made and no holes and no rust plugs are found during the lining process.*

Recently two industry corrosion experts stated that they would expect 25% of the existing USTs would not qualify for corrosion upgrade. A significant differentiation from the experience we have in Wisconsin. We are experiencing very few site assessments being initiated or disqualification from lining, from the pre-lining internal inspection. Considering the age population of tanks that are being lined, *it is very unlikely that a large percentage do not exhibit rust* plugs or holes. In fact, the department has received several lining reports that indicate holes and leakage, but which no assessment was conducted. Currently the Department is referring these reports to the WDNR. *The Department will be initiating a policy to refer suspect lining reports to the inspector with jurisdiction over the site for site assessment orders*.

Reasons that contamination assessment initiated from the observation of rust plugs is ignored or evaded:

- Cost associated with the lining process already incurred at this point in the process. ($1500 - $4500)
- Additional cost of assessment.
- Additional down time of tank system while assessment is being obtained.
- Liner will experience down time or move to another site. Additional costs to move back.
- Liner or owner believing that integrity of lining will adequately seal tank against future internal leakage.
- Fear of costs and consequences associated with the discovery of contamination.
- Belief that when existing or potential contamination becomes an issue, someone else will own the system.

- *Failure by owner to realize that when the system is upgraded the system will no longer be eligible for PECFA coverage when contamination is discovered.*

After the abrasive blasting when perforations are present, a ballpeen hammer test *must* be conducted by tapping the interior of the tank shell to sound for thin areas around the perforations. The integrity check of the tank shell is quite dependent upon individual skill and consciousness. The liner must maintain a uniform beat and pressure when conducting the ballpeen test, while listening for changes in resonance to determine thin areas of shell wall thickness. Not a very high tech procedure. High tech and more reliable procedures, such as ultrasound scanning, is available but not required to be used.

Perforations must be reamed, measured and counted. The NLPA standard includes criteria regarding the allowable size and number of perforations acceptable for repair and lining. If the tank interior qualifies, the tank lining process may begin.

Numerous types of lining products are available. Many are referred to as "epoxy" and are shipped in 5 gallon or 55 gallon containers. A 10,000 gallon tank will typically require 60 gallons of material. The tolerances or compatibility of the lining materials are as numerous as the number of products on the market.

Temperatures at which the material may be applied may vary. We have seen temperature criteria ranging from 55 to 77 degrees. The requirements are usually associated with the temperature of the substrate (tank shell) that the lining material is applied to. The Department is aware of liners forcing curing of the lining by introducing warmer temperatures into the tank. This practice is acceptable if the method is at a high enough temperature for an adequate time period to raise the temperature of the tank shell to acceptable levels. One lining material manufacture has instructions that require heating ambient air in the tank to 180 - 220^{o} with a 300,000 BTU air heater for a minimum of three hours until a Barcol hardness reading of 65-70^{o} S (Scale) is obtained.

Lining products differ in compatibility to hydrocarbon products such as oxygenated fuels, and additives such as emission inhibitors. A liner material meeting compatibility with today's additives may not be compatible with additives used tomorrow. A failure the warranty probably will not cover. Several of the lining failures have been contributed, by the liner, to be the result of fuel additives. In some cases a debatable issue.

The liner must apply the lining material before the white metal begins to accumulate rust from the tank's internal environment. Liners attempt to complete the blasting and cleanup at a time when they can move right into lining application, or be down for the night and start the lining early the next morning. Generally, the maximum acceptable time between blasting and lining is eight to twelve hours.

After the lining has been applied several tests must be conducted:

Thickness - a thickness gauge (e.g., Elcometer) must be used to determine that the lining has been applied within the manufacturer's specifications. The lining can not be below the minimum, and must be with a nominal tolerance.

Hardness - a hardness gauge (e.g., Barcol Hardness Tester) shall be used to establish if the lining has cured to the proper tolerance established by the manufacturer.

Holidays - a Holiday tester is used to determine if the lining is within tolerances for air pockets or pin holes, referred to as holidays.

Regulatory Oversight

The manufacturer's specification and application guide will provide detail about the product and application criteria:

- Preliminary inspection or assessment.
- Surface preparation.
- Lining material specifications.

- Application specifications (including overcoat preparation)).
- Curing criteria (including forced curing)
- Post application testing.

Inspectors providing regulatory oversight to a UST lining should take note of the following items:

1. If rust plugs or holes are evident, was a site assessment conducted?
2. Are temperature and humidity conditions right for abrasive blasting?
3. Is the amount of material (abrasive and lining product) adequate for the size of the tank?
4. Is the lining product and conditions compatible with the product?
5. Are gauges and testing devices provided to conduct the appropriate tests?
6. Were the tests conducted and documented?
7. When the operator is planning to fill the tank and place the system in operation. (Some lining products require 7 days to cure before filling the tank with product.)

One national lining company has provided the following information as a guide

> To complete the lining of a single 4,000 gallon gasoline tank, beginning with decommissioning and excavating, through lining, thickness and hardness testing, to resealing the tank, a crew of three would work approximately twenty-four total work hours. A 10,000 gallon tank would take approximately thirty-two total work hours. A job involving two tanks at the same site would take approximately forty total work hours.